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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,792	02/09/2006	Katsuyoshi Nakatsukasa	062032	2688

38834 7590 10/22/2007

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
1250 CONNECTICUT AVENUE, NW
SUITE 700
WASHINGTON, DC 20036

EXAMINER	
GRAVINI, STEPHEN MICHAEL	

ART UNIT	PAPER NUMBER
3749	

MAIL DATE	DELIVERY MODE
10/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/567,792	NAKATSUKASA ET AL.	
	Examiner	Art Unit	
	Stephen Gravini	3749	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-4 and 6-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *7-8 and 9 as dependent upon 7 or 8* is/are allowed.

6)☐ Claim(s) *2-4 and 6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

Claims 2-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Vaarstra et al. (US 6,294,575). The claims are reasonably and broadly construed as being disclosed by Vaarstra as comprising:

a substrate processing method in which a substrate surface is dried by injecting it with dry gas comprising a mixture of an organic solvent vapor and an inert gas, the substrate processing method characterized in that the dry gas is a mixture of inert gas and the organic solvent vapor, wherein the mixed gas is formed by bubbling the inert gas in an organic solvent in a vapor generating unit at column 4 lines 25-34,

wherein the temperature in said vapor generating unit is set at T_1 at column 4 lines 43-54,

the temperature of the mixed gas containing the organic solvent and the inert gas is set at T_2 from the vapor generating unit to a jet nozzle at column 8 line 59 through column 9 line 6, and

the temperature of the dry gas emitted from the jet nozzle is set at T_3 at column 9 lines 7-15,

and the temperatures are controlled such that the following relationship holds:

$T_1 \leq T_2 \leq T_3 \leq$ boiling point of organic solvent which is inherent to the teachings of Vaarstra because once heat is applied to the vapor generating unit, the temperature of

the vapor gas mixture lowers continually to less than the boiling point of the disclosed organic solvent since it necessarily follows that no heat is further applied after the disclosed vapor generating stage and thermodynamically temperature will drop if no more heat is applied in the disclosed method, and

the organic solvent mist of submicron size is part of the dry gas emitted from said jet nozzle at column 9 line 53 through column 10 line 9; or alternatively:

a substrate processing method in which a substrate surface is dried by injecting it with dry gas containing a mixture of an organic solvent vapor and an inert gas, the substrate processing method characterized in that the dry gas containing the mixture of inert gas and the organic solvent vapor is further diluted with dilution gas of the same kind of inert gas, wherein the mixed gas is formed by bubbling the inert gas in an organic solvent in a vapor generating unit at column 4 lines 25-34,

wherein the temperature in the vapor generating unit is set at T_1 at column 4 lines 43-54,

the temperature of the mixed gas is set at T_2" from the vapor generating unit until the mixed gas is diluted with the dilution gas at column 8 line 59 through column 9 line 6;

the temperature of the dilution gas is set at T_4 at column 3 lines 1-10,

the temperature of the mixed gas containing the organic solvent and the inert gas is set at T_2" to the jet nozzle after the mixed gas is diluted with the dilution gas at column 8 line 59 through column 9 line 6, and

the temperature of the dry gas emitted from the jet nozzle is set at T_3 at column 9 lines 7-15,

and the temperatures are controlled such that the following relationship holds:

$T_1 \leq T_2' \leq T_4 \leq T_2'' \leq T_3$ boiling point of organic solvent which is inherent to the teachings of Vaarstra because once heat is applied to the vapor generating unit, the temperature of the vapor gas mixture lowers continually to less than the boiling point of the disclosed organic solvent since it necessarily follows that no heat is further applied after the disclosed vapor generating stage and thermodynamically temperature will drop if no more heat is applied in the disclosed method, and

the organic solvent mist of submicron size is included in the dry gas emitted from the jet nozzle at column 9 line 53 through column 10 line 9. Vaarstra also discloses the claimed organic solvent being at least one kind selected from a group including isopropyl alcohol, diacetone alcohol, 1-methoxy-2-propanol, ethyl glycol, 1-propanol, 2-propanol, and tetrahydrofuran, and said inert gas being at least one kind selected from a group including nitrogen, argon, and helium at column 7 lines 47-60 and column 2 lines 65-67.

Claim 6 is rejected under 35 U.S.C. 102(b) as being anticipated by Ichiko et al. (US 5,950,328). The claims are reasonably and broadly construed as being disclosed by Ichiko as comprising:

a vapor generating unit **8** which generates a mixed gas of an organic solvent vapor and an inert gas by bubbling the inert gas in an organic solvent;

support means **22** for supporting a plurality of substrates vertically arranged in parallel at equal pitches;

a rinsing processing vessel **7** which accommodates the plurality of substrates supported by the support means;

a lid **9, 10** for covering the upper opening of said rinsing processing vessel at column 5 lines 13-31;

jet nozzles **32** which are provided in the lid; and

first piping **30** which allows the vapor generating unit and the jet nozzles to communicate with each other,

the substrate processing apparatus characterized in that the first piping and the jet nozzles are respectively equipped with heaters **12**,

wherein the temperature in the vapor generating unit is set at T_1, the temperature in the first piping is set at T_2, and the temperature in the jet nozzle is set at T_3, and the temperatures are controlled by the respective heaters such that the following relationship holds: $T_1 \leq T_2 \leq T_3$ boiling point of organic solvent which is inherent to the teachings of Vaarstra because once heat is applied to the vapor generating unit, the temperature of the vapor gas mixture lowers continually to less than the boiling point of the disclosed organic solvent since it necessarily follows that no heat is further applied after the disclosed vapor generating stage and thermodynamically temperature will drop if no more heat is applied in the disclosed system, and

the organic solvent mist of submicron size is part of the dry gas emitted from the jet nozzle at column 8 lines 60 through column 9 line 8.

Claim Rejections - 35 USC § 103

Claim 9, as dependent upon claim 6, is rejected under 35 U.S.C. 103(a) as being unpatentable over Ichiko in view of Vaarstra. Ichiko discloses the claimed invention, as rejected above, except for the claimed organic solvent being at least one kind selected from a group including isopropyl alcohol, diacetone alcohol, 1-methoxy-2-propanol, ethyl glycol, 1-propanol, 2- propanol, and tetrahydrofuran, and said inert gas being at least one kind selected from a group including nitrogen, argon, and helium. Vaarstra, another substrate processing apparatus, discloses the claimed organic solvent being at least one kind selected from a group including isopropyl alcohol, diacetone alcohol, 1-methoxy-2-propanol, ethyl glycol, 1-propanol, 2- propanol, and tetrahydrofuran, and said inert gas being at least one kind selected from a group including nitrogen, argon, and helium at column 7 lines 47-60 and column 2 lines 65-67. It would have been obvious to one skilled in the art to combine the teachings of Ichiko with the organic solvent being at least one kind selected from a group including isopropyl alcohol, diacetone alcohol, 1-methoxy-2-propanol, ethyl glycol, 1-propanol, 2- propanol, and tetrahydrofuran, and said inert gas being at least one kind selected from a group including nitrogen, argon, and helium, disclosed in Vaarstra for the purpose of providing an organic solvent cleaning/rinsing fluid to maintain a clean substrate and inert gas for continuing the clean environment.

Response to Arguments

Applicant's arguments filed September 12, 2007 have been fully considered but they are not persuasive.

anticipation

Applicants argue that the claimed and argued temperature profile of $T_1 \leq T_2 \leq T_3$ is patentable over prior art primary reference Vaarstra. However, as applicants recognize in their response to a first Office action on the merits, Vaarstra discloses that inert gas is heated as it flows into a vapor generating unit. This disclosure establishes an initial temperature T_1. Applicants also recognize that no heat is added after the vapor generating unit of Vaarstra. Using this disclosure and the first law of thermodynamics in which the increase in the internal energy of a thermodynamic system is equal to the amount of heat energy added to the system minus the work done by the system on the surroundings. It is well known to those skilled in the art that when no heat is added or when no work is done, the internal energy of a thermodynamic system will decrease. Also to those skilled in the art, internal energy corresponds to temperature measured throughout a thermodynamic system. Since applicants recognize that no heat is added after the vapor generating unit and no disclosed work is applied after that unit, the temperature throughout the thermodynamic system must decrease such that the temperature profile of $T_1 \leq T_2 \leq T_3$ will necessarily result. Applicants also argue that the asserted submicron size being less than 1 μm is not taught in the prior art, but that element is not claimed, so the rejection is believed proper.

Likewise, applicants argue that the claimed invention is patentable of Ichiko for the same reasons argued in light of Vaarstra. As applicants recognize in their response to a first Office action on the merits, Ichiko discloses that inert gas is heated as it flows

into a vapor generating unit. This disclosure establishes an initial temperature T_1. Applicants also recognize that no heat is added after the vapor generating unit of Ichiko. Using this disclosure and the first law of thermodynamics (recited above). It is well known to those skilled in the art that when no heat is added or when no work is done, the internal energy of a thermodynamic system will decrease. Also to those skilled in the art, internal energy corresponds to temperature measured throughout a thermodynamic system. Since applicants recognize that no heat is added after the vapor generating unit and no disclosed work is applied after that unit, the temperature throughout the thermodynamic system must decrease such that the temperature profile of $T_1 \leq T_2 \leq T_3$ will necessarily result.

obviousness

Applicants argue that since the anticipation rejections should be withdrawn, so should the obviousness rejections. However, as responded above, the anticipatory rejection is believed proper such that the obviousness rejection is believed proper.

Allowable Subject Matter

Claims 7-8 and 9 as dependent upon 7 or 8 are allowable over the prior art because the claimed the substrate processing apparatus characterized in that a second piping is provided and connected to the middle portion of the first piping for the purpose of supplying dilution gas of the same kind of inert gas is not found in the prior art either singly or in combination. The closest prior art references are Vaarstra and Ichiko used in the rejection above and JP 11-191549, cited by applicants. Those references

disclosed inert gas and vapor mixing in substrate processing but not the second piping middle portion supply of same kind dilution gas.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Gravini whose telephone number is 571 272 4875. The examiner can normally be reached on normal weekday business hours (east coast time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven B. McAllister can be reached on 571 272 6785. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SMG
October 8, 2007

Stephen Gravini